

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT

STRUCTURE
SUBSURFACE INVESTIGATION

PROJ. REFERENCE NO. M-0423 (42608.1JA8) F.A. PROJ. _____
 COUNTY CHATHAM
 PROJECT DESCRIPTION ARRA BRIDGES - DIVISION 8

SITE DESCRIPTION BRIDGE NO. 412 ON S.R. 2160 (OLD GOLDSTON RD.) OVER ROBESON CREEK

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<u>SHEET</u>	<u>DESCRIPTION</u>
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PERSONNEL

MIKE BRANDON
ANDY CRUMBLEY
WILLIE DUGGINS
ANDREW NASH
JACOB BARE

INVESTIGATED BY ANDREW NASH
 CHECKED BY ANDREW NASH
 SUBMITTED BY SUMMIT CONSULTING
 DATE _____

CAUTION NOTICE

THE SUBSURFACE INFORMATION AND THE SUBSURFACE INVESTIGATION ON WHICH IT IS BASED WERE MADE FOR THE PURPOSE OF PREPARING THE SCOPE OF WORK TO BE INCLUDED IN THE REQUEST FOR PROPOSAL. THE VARIOUS FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA AVAILABLE MAY BE REVIEWED OR INSPECTED IN RALEIGH BY CONTACTING THE N.C. DEPARTMENT OF TRANSPORTATION, GEOTECHNICAL ENGINEERING UNIT AT (919) 250-4088. THE SUBSURFACE PLANS AND REPORTS, FIELD BORING LOGS, ROCK CORES, AND SOIL TEST DATA ARE NOT PART OF THE CONTRACT.

SOIL AND ROCK BOUNDARIES WITHIN A BOREHOLE ARE BASED ON GEOTECHNICAL INTERPRETATION UNLESS ENCOUNTERED IN A SAMPLE. INTERPRETED BOUNDARIES MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN SAMPLED STRATA, AND BOREHOLE INFORMATION MAY NOT NECESSARILY REFLECT ACTUAL SUBSURFACE CONDITIONS BETWEEN BORINGS. THE LABORATORY SAMPLE DATA AND THE IN SITU ON-PLACE TEST DATA CAN BE RELIED ON ONLY TO THE DEGREE OF RELIABILITY INHERENT IN THE STANDARD TEST METHOD. THE OBSERVED WATER LEVELS OR SOIL MOISTURE CONDITIONS INDICATED IN THE SUBSURFACE INVESTIGATIONS ARE AS RECORDED AT THE TIME OF THE INVESTIGATION. THESE WATER LEVELS OR SOIL MOISTURE CONDITIONS MAY VARY CONSIDERABLY WITH TIME ACCORDING TO CLIMATIC CONDITIONS INCLUDING TEMPERATURES, PRECIPITATION, AND WIND, AS WELL AS OTHER NON-CLIMATIC FACTORS.

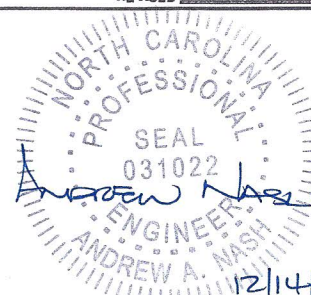
THE DEPARTMENT DOES NOT WARRANT OR GUARANTEE THE SUFFICIENCY OR ACCURACY OF THE INVESTIGATION MADE, OR OPINION OF THE DEPARTMENT AS TO THE TYPE OF MATERIALS AND CONDITIONS TO BE ENCOUNTERED. THE BIDDER OR CONTRACTOR IS CAUTIONED TO MAKE SUCH INDEPENDENT SUBSURFACE INVESTIGATIONS AS HE DEEMS NECESSARY TO SATISFY HIMSELF AS TO CONDITIONS TO BE ENCOUNTERED ON THE PROJECT. THE CONTRACTOR SHALL HAVE NO CLAIM FOR ADDITIONAL COMPENSATION OR FOR AN EXTENSION OF TIME FOR ANY REASON RESULTING FROM THE ACTUAL CONDITIONS ENCOUNTERED AT THE SITE DIFFERING FROM THOSE INDICATED IN THE SUBSURFACE INFORMATION.

NOTE - THE INFORMATION CONTAINED HEREIN IS NOT IMPLIED OR GUARANTEED BY THE N.C. DEPARTMENT OF TRANSPORTATION AS BEING ACCURATE NOR IT IS CONSIDERED TO BE PART OF THE PLANS, SPECIFICATIONS, OR CONTRACT FOR THE PROJECT.

NOTE - BY HAVING REQUESTED THIS INFORMATION THE CONTRACTOR SPECIFICALLY WAIVES ANY CLAIMS FOR INCREASED COMPENSATION OR EXTENSION OF TIME BASED ON DIFFERENCES BETWEEN THE CONDITIONS INDICATED HEREIN AND THE ACTUAL CONDITIONS AT THE PROJECT SITE.

DRAWN BY: MIKE BRANDON





REVISED 12/14/2010



NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS


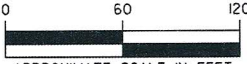
SOIL DESCRIPTION										GRADATION															
SOIL IS CONSIDERED TO BE THE UNCONSOLIDATED, SEMI-CONSOLIDATED, OR WEATHERED EARTH MATERIALS THAT CAN BE PENETRATED WITH A CONTINUOUS FLIGHT POWER AUGER AND YIELD LESS THAN 100 BLOWS PER FOOT ACCORDING TO STANDARD PENETRATION TEST (AASHTO T206, ASTM D-1586). SOIL CLASSIFICATION IS BASED ON THE AASHTO SYSTEM. BASIC DESCRIPTIONS GENERALLY SHALL INCLUDE: CONSISTENCY, COLOR, TEXTURE, MOISTURE, AASHTO CLASSIFICATION, AND OTHER PERTINENT FACTORS SUCH AS MINERALOGICAL COMPOSITION, ANGULARITY, STRUCTURE, PLASTICITY, ETC. EXAMPLE: <i>VERY STIFF, GRAY, SILTY CLAY, MOST WITH INTERBEDDED FINE SAND LAYERS, MEDIUM PLASTIC, A-7-6</i>										WELL GRADED - INDICATES A GOOD REPRESENTATION OF PARTICLE SIZES FROM FINE TO COARSE. UNIFORM - INDICATES THAT SOIL PARTICLES ARE ALL APPROXIMATELY THE SAME SIZE. (ALSO POORLY GRADED) GAP-GRADED - INDICATES A MIXTURE OF UNIFORM PARTICLES OF TWO OR MORE SIZES.															
										ANGULARITY OF GRAINS THE ANGULARITY OR ROUNDNESS OF SOIL GRAINS IS DESIGNATED BY THE TERMS <u>ANGULAR</u> , <u>SUBANGULAR</u> , <u>SUBROUNDED</u> , OR <u>ROUNDED</u> .															
										MINERALOGICAL COMPOSITION MINERAL NAMES SUCH AS QUARTZ, FELDSPAR, MICA, TALC, KAOLIN, ETC. ARE USED IN DESCRIPTIONS WHENEVER THEY ARE CONSIDERED OF SIGNIFICANCE.															
SOIL LEGEND AND AASHTO CLASSIFICATION										COMPRESSIONIBILITY															
GENERAL CLASS.	GRANULAR MATERIALS ($\leq 35\%$ PASSING #200)					SILT-CLAY MATERIALS ($> 35\%$ PASSING #200)					ORGANIC MATERIALS					SLIGHTLY COMPRESSIBLE MODERATELY COMPRESSIBLE HIGHLY COMPRESSIBLE									
GROUP CLASS.	A-1, A-3, A-2, A-4, A-5, A-6, A-7					A-1, A-2, A-3, A-4, A-5, A-6, A-7					A-1, A-2, A-3, A-4, A-5, A-6, A-7														
SYMBOL																									
% PASSING	50 MX, 30 MX, 15 MX, 10 MX, 5 MN, 2 MN, 1 MN					40 MX, 30 MX, 15 MX, 10 MX, 5 MN, 2 MN, 1 MN					GRANULAR SOILS, SILT-CLAY SOILS, MUCK, PEAT														
LIQUID LIMIT	6 MX, NP, 40 MX, 30 MX, 15 MX, 10 MX, 5 MN, 2 MN, 1 MN					40 MX, 30 MX, 15 MX, 10 MX, 5 MN, 2 MN, 1 MN					SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER, HIGHLY ORGANIC SOILS														
PLASTIC INDEX	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50					40 MX, 30 MX, 15 MX, 10 MX, 5 MN, 2 MN, 1 MN					SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER, HIGHLY ORGANIC SOILS														
GROUP INDEX	0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50					40 MX, 30 MX, 15 MX, 10 MX, 5 MN, 2 MN, 1 MN					SOILS WITH LITTLE OR MODERATE AMOUNTS OF ORGANIC MATTER, HIGHLY ORGANIC SOILS														
USUAL TYPES OF MAJOR MATERIALS	FINE SAND, SILTY OR CLAYEY GRAVEL AND SAND, SILTY SOILS, CLAYEY SOILS					FAIR TO POOR					FAIR TO POOR, POOR, UNSUITABLE														
GEN. RATING AS A SUBGRADE	EXCELLENT TO GOOD					FAIR TO POOR					FAIR TO POOR, POOR, UNSUITABLE														
PI OF A-7-5 SUBGROUP IS \leq LL - 30 ; PI OF A-7-6 SUBGROUP IS $>$ LL - 30																									
CONSISTENCY OR DENSENESS										MISCELLANEOUS SYMBOLS															
PRIMARY SOIL TYPE	COMPACTNESS OR CONSISTENCY					RANGE OF STANDARD PENETRATION RESISTANCE (N-VALUE)					RANGE OF UNCONFINED COMPRESSIVE STRENGTH (TONS/FT ²)					 SOIL SYMBOL ARTIFICIAL FILL (AF) OTHER THAN ROADWAY EMBANKMENT INFERRED SOIL BOUNDARY INFERRED ROCK LINE ALLUVIAL SOIL BOUNDARY DIP & DIP DIRECTION OF ROCK STRUCTURES TEST BORING AUGER BORING CORE BORING MONITORING WELL PIEZOMETER INSTALLATION SLOPE INDICATOR INSTALLATION CONE PENETROMETER TEST SOUNDING ROD									
GENERALLY GRANULAR MATERIAL (NON-COHESIVE)	VERY LOOSE, LOOSE, MEDIUM DENSE, DENSE, VERY DENSE					4, 10, 30, 50, 100, 150, 200, 250, 300, 350, 400, 450, 500, 550, 600, 650, 700, 750, 800, 850, 900, 950, 1000					N/A														
GENERALLY SILT-CLAY MATERIAL (COHESIVE)	VERY SOFT, SOFT, MEDIUM STIFF, STIFF, VERY STIFF, HARD					2, 4, 8, 15, 30, 60, 120, 240, 480, 960, 1920, 3840, 7680, 15360, 30720, 61440, 122880, 245760, 491520, 983040, 1966080, 3932160, 7864320, 15728640, 31457280, 62914560, 125829120, 251658240, 503316480, 1006632960, 2013265920, 4026531840, 8053063680, 16106127360, 32212254720, 64424509440, 128849018880, 257698037760, 515396075520, 1030792151040, 2061584302080, 4123168604160, 8246337208320, 16492674416640, 32985348833280, 65970697666560, 131941395333120, 263882790666240, 527765581332480, 1055531162664960, 2111062325329920, 4222124650659840, 8444249301319680, 16888498602639360, 33776997205278720, 67553994410557440, 135107988821114880, 270215977642229760, 540431955284459520, 1080863910568919040, 2161727821137838080, 4323455642275676160, 8646911284551352320, 17293822569102704640, 34587645138205409280, 69175290276410818560, 138350580552821637120, 276701161105643274240, 553402322211286548480, 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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
GEOTECHNICAL ENGINEERING UNIT
SOIL AND ROCK LEGEND, TERMS, SYMBOLS, AND ABBREVIATIONS

ROCK DESCRIPTION		TERMS AND DEFINITIONS			
HARD ROCK IS NON-COASTAL PLAIN MATERIAL THAT IF TESTED, WOULD YIELD SPT REFUSAL. AN INFERRED ROCK LINE INDICATES THE LEVEL AT WHICH NON-COASTAL PLAIN MATERIAL WOULD YIELD SPT REFUSAL. SPT REFUSAL IS PENETRATION BY A SPLIT SPOON SAMPLER EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. IN NON-COASTAL PLAIN MATERIAL, THE TRANSITION BETWEEN SOIL AND ROCK IS OFTEN REPRESENTED BY A ZONE OF WEATHERED ROCK. ROCK MATERIALS ARE TYPICALLY DIVIDED AS FOLLOWS:		ALLUVIUM (ALLUV.) - SOILS THAT HAVE BEEN TRANSPORTED BY WATER. AQUIFER - A WATER BEARING FORMATION OR STRATA. ARENACEOUS - APPLIED TO ROCKS THAT HAVE BEEN DERIVED FROM SAND OR THAT CONTAIN SAND. ARGILLACEOUS - APPLIED TO ALL ROCKS OR SUBSTANCES COMPOSED OF CLAY MINERALS, OR HAVING A NOTABLE PROPORTION OF CLAY IN THEIR COMPOSITION, AS SHALE, SLATE, ETC. ARTESIAN - GROUND WATER THAT IS UNDER SUFFICIENT PRESSURE TO RISE ABOVE THE LEVEL AT WHICH IT IS ENCOUNTERED, BUT WHICH DOES NOT NECESSARILY RISE TO OR ABOVE THE GROUND SURFACE. CALCAREOUS (CALC.) - SOILS THAT CONTAIN APPRECIABLE AMOUNTS OF CALCIUM CARBONATE. COLLUVIUM - ROCK FRAGMENTS MIXED WITH SOIL DEPOSITED BY GRAVITY ON SLOPE OR AT BOTTOM OF SLOPE. CORE RECOVERY (REC.) - TOTAL LENGTH OF ALL MATERIAL RECOVERED IN THE CORE BARREL DIVIDED BY TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. DIKE - A TABULAR BODY OF IGNEOUS ROCK THAT CUTS ACROSS THE STRUCTURE OF ADJACENT ROCKS OR CUTS MASSIVE ROCK. DIP - THE ANGLE AT WHICH A STRATUM OR ANY PLANAR FEATURE IS INCLINED FROM THE HORIZONTAL. DIP DIRECTION (DIP AZIMUTH) - THE DIRECTION OR BEARING OF THE HORIZONTAL TRACE OF THE LINE OF DIP, MEASURED CLOCKWISE FROM NORTH. FAULT - A FRACTURE OR FRACTURE ZONE ALONG WHICH THERE HAS BEEN DISPLACEMENT OF THE SIDES RELATIVE TO ONE ANOTHER PARALLEL TO THE FRACTURE. FISSILE - A PROPERTY OF SPLITTING ALONG CLOSELY SPACED PARALLEL PLANES. FLOAT - ROCK FRAGMENTS ON SURFACE NEAR THEIR ORIGINAL POSITION AND DISLODGED FROM PARENT MATERIAL. FLOOD PLAIN (FP) - LAND BORDERING A STREAM, BUILT OF SEDIMENTS DEPOSITED BY THE STREAM. FORMATION (FMJ) - A MAPPABLE GEOLOGIC UNIT THAT CAN BE RECOGNIZED AND TRACED IN THE FIELD. JOINT - FRACTURE IN ROCK ALONG WHICH NO APPRECIABLE MOVEMENT HAS OCCURRED. LEDGE - A SHELF-LIKE RIDGE OR PROJECTION OF ROCK WHOSE THICKNESS IS SMALL COMPARED TO ITS LATERAL EXTENT. LENS - A BODY OF SOIL OR ROCK THAT THINS OUT IN ONE OR MORE DIRECTIONS. MOTTLED (MOT.) - IRREGULARLY MARKED WITH SPOTS OF DIFFERENT COLORS. MOTTLING IN SOILS USUALLY INDICATES POOR AERATION AND LACK OF GOOD DRAINAGE. PERCHED WATER - WATER MAINTAINED ABOVE THE NORMAL GROUND WATER LEVEL BY THE PRESENCE OF AN INTERVENING IMPERVIOUS STRATUM. RESIDUAL (RES.) SOIL - SOIL FORMED IN PLACE BY THE WEATHERING OF ROCK. ROCK QUALITY DESIGNATION (RQD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF CORE RUN AND EXPRESSED AS A PERCENTAGE. SAPROLITE (SAP.) - RESIDUAL SOIL THAT RETAINS THE RELIC STRUCTURE OR FABRIC OF THE PARENT ROCK. SILL - AN INTRUSIVE BODY OF IGNEOUS ROCK OF APPROXIMATELY UNIFORM THICKNESS AND RELATIVELY THIN COMPARED WITH ITS LATERAL EXTENT, THAT HAS BEEN EMPLACED PARALLEL TO THE BEDDING OR SCHISTOSITY OF THE INTRUDED ROCKS. SLICKENSIDE - POLISHED AND STRIATED SURFACE THAT RESULTS FROM FRICTION ALONG A FAULT OR SLIP PLANE. STANDARD PENETRATION TEST (PENETRATION RESISTANCE) (SPT) - NUMBER OF BLOWS (IN OR BPF) OF A 140 LB. HAMMER FALLING 30 INCHES REQUIRED TO PRODUCE A PENETRATION OF 1 FOOT INTO SOIL WITH A 2 INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER. SPT REFUSAL IS PENETRATION EQUAL TO OR LESS THAN 0.1 FOOT PER 60 BLOWS. STRATA CORE RECOVERY (SREC) - TOTAL LENGTH OF STRATA MATERIAL RECOVERED DIVIDED BY TOTAL LENGTH OF STRATUM AND EXPRESSED AS A PERCENTAGE. STRATA ROCK QUALITY DESIGNATION (SROD) - A MEASURE OF ROCK QUALITY DESCRIBED BY TOTAL LENGTH OF ROCK SEGMENTS WITHIN A STRATUM EQUAL TO OR GREATER THAN 4 INCHES DIVIDED BY THE TOTAL LENGTH OF STRATA AND EXPRESSED AS A PERCENTAGE. TOPSOIL (TS.) - SURFACE SOILS USUALLY CONTAINING ORGANIC MATTER.			
WEATHERED ROCK (WR)		NON-COASTAL PLAIN MATERIAL THAT WOULD YIELD SPT N VALUES > 100 BLOWS PER FOOT IF TESTED.			
CRYSTALLINE ROCK (CR)		FINE TO COARSE GRAIN IGNEOUS AND METAMORPHIC ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES GRANITE, GNEISS, GABBRO, SCHIST, ETC.			
NON-CRYSTALLINE ROCK (NCR)		FINE TO COARSE GRAIN METAMORPHIC AND NON-COASTAL PLAIN SEDIMENTARY ROCK THAT WOULD YIELD SPT REFUSAL IF TESTED. ROCK TYPE INCLUDES PHYLLITE, SLATE, SANDSTONE, ETC.			
COASTAL PLAIN SEDIMENTARY ROCK (CP)		COASTAL PLAIN SEDIMENTS CEMENTED INTO ROCK, BUT MAY NOT YIELD SPT REFUSAL. ROCK TYPE INCLUDES LIMESTONE, SANDSTONE, CEMENTED SHELL BEDS, ETC.			
WEATHERING					
FRESH	ROCK FRESH, CRYSTALS BRIGHT, FEW JOINTS MAY SHOW SLIGHT STAINING. ROCK RINGS UNDER HAMMER IF CRYSTALLINE.				
VERY SLIGHT (V SL.)	ROCK GENERALLY FRESH, JOINTS STAINED, SOME JOINTS MAY SHOW THIN CLAY COATINGS IF OPEN. CRYSTALS ON A BROKEN SPECIMEN FACE SHINE BRIGHTLY. ROCK RINGS UNDER HAMMER BLOWS IF OF A CRYSTALLINE NATURE.				
SLIGHT (SL.)	ROCK GENERALLY FRESH, JOINTS STAINED AND DISCOLORATION EXTENDS INTO ROCK UP TO 1 INCH. OPEN JOINTS MAY CONTAIN CLAY. IN GRANITOID ROCKS SOME OCCASIONAL FELDSPAR CRYSTALS ARE DULL AND DISCOLORED. CRYSTALLINE ROCKS RING UNDER HAMMER BLOWS.				
MODERATE (MOD.)	SIGNIFICANT PORTIONS OF ROCK SHOW DISCOLORATION AND WEATHERING EFFECTS. IN GRANITOID ROCKS, MOST FELDSPARS ARE DULL AND DISCOLORED, SOME SHOW CLAY. ROCK HAS DULL SOUND UNDER HAMMER BLOWS AND SHOWS SIGNIFICANT LOSS OF STRENGTH AS COMPARED WITH FRESH ROCK.				
MODERATELY SEVERE (MOD. SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. IN GRANITOID ROCKS, ALL FELDSPARS DULL AND DISCOLORED AND A MAJORITY SHOW KAOLINIZATION. ROCK SHOWS SEVERE LOSS OF STRENGTH AND CAN BE EXCAVATED WITH A GEOLOGIST'S PICK. ROCK GIVES "CLUNK" SOUND WHEN STRUCK. <u>IF TESTED, WOULD YIELD SPT REFUSAL</u>				
SEVERE (SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC CLEAR AND EVIDENT BUT REDUCED IN STRENGTH TO STRONG SOIL. IN GRANITOID ROCKS ALL FELDSPARS ARE KAOLINIZED TO SOME EXTENT. SOME FRAGMENTS OF STRONG ROCK USUALLY REMAIN. <u>IF TESTED, YIELDS SPT N VALUES > 100 BPF</u>				
VERY SEVERE (V SEV.)	ALL ROCK EXCEPT QUARTZ DISCOLORED OR STAINED. ROCK FABRIC ELEMENTS ARE DISCERNIBLE BUT THE MASS IS EFFECTIVELY REDUCED TO SOIL STATUS, WITH ONLY FRAGMENTS OF STRONG ROCK REMAINING. SAPROLITE IS AN EXAMPLE OF ROCK WEATHERED TO A DEGREE SUCH THAT ONLY MINOR VESTIGES OF THE ORIGINAL ROCK FABRIC REMAIN. <u>IF TESTED, YIELDS SPT N VALUES < 100 BPF</u>				
COMPLETE	ROCK REDUCED TO SOIL. ROCK FABRIC NOT DISCERNIBLE, OR DISCERNIBLE ONLY IN SMALL AND SCATTERED CONCENTRATIONS. QUARTZ MAY BE PRESENT AS DIKES OR STRINGERS. SAPROLITE IS ALSO AN EXAMPLE.				
ROCK HARDNESS					
VERY HARD	CANNOT BE SCRATCHED BY KNIFE OR SHARP PICK. BREAKING OF HAND SPECIMENS REQUIRES SEVERAL HARD BLOWS OF THE GEOLOGIST'S PICK.				
HARD	CAN BE SCRATCHED BY KNIFE OR PICK ONLY WITH DIFFICULTY. HARD HAMMER BLOWS REQUIRED TO DETACH HAND SPECIMEN.				
MODERATELY HARD	CAN BE SCRATCHED BY KNIFE OR PICK. GOUGES OR GROOVES TO 0.25 INCHES DEEP CAN BE EXCAVATED BY HARD BLOW OF A GEOLOGIST'S PICK. HAND SPECIMENS CAN BE DETACHED BY MODERATE BLOWS.				
MEDIUM HARD	CAN BE GROOVED OR GOUGED 0.05 INCHES DEEP BY FIRM PRESSURE OF KNIFE OR PICK POINT. CAN BE EXCAVATED IN SMALL CHIPS TO PEICES 1 INCH MAXIMUM SIZE BY HARD BLOWS OF THE POINT OF A GEOLOGIST'S PICK.				
SOFT	CAN BE GROVED OR GOUGED READILY BY KNIFE OR PICK. CAN BE EXCAVATED IN FRAGMENTS FROM CHIPS TO SEVERAL INCHES IN SIZE BY MODERATE BLOWS OF A PICK POINT. SMALL, THIN PIECES CAN BE BROKEN BY FINGER PRESSURE.				
VERY SOFT	CAN BE CARVED WITH KNIFE. CAN BE EXCAVATED READILY WITH POINT OF PICK. PIECES 1 INCH OR MORE IN THICKNESS CAN BE BROKEN BY FINGER PRESSURE. CAN BE SCRATCHED READILY BY FINGERNAIL.				
FRACTURE SPACING		BEDDING			
TERM	SPACING	TERM	THICKNESS		
VERY WIDE	MORE THAN 10 FEET	VERY THICKLY BEDDED	> 4 FEET		
WIDE	3 TO 10 FEET	THICKLY BEDDED	1.5 - 4 FEET		
MODERATELY CLOSE	1 TO 3 FEET	THINLY BEDDED	0.16 - 1.5 FEET		
CLOSE	0.16 TO 1 FEET	VERY THINLY BEDDED	0.03 - 0.16 FEET		
VERY CLOSE	LESS THAN 0.16 FEET	THICKLY LAMINATED	0.008 - 0.03 FEET		
		THINLY LAMINATED	< 0.008 FEET		
INDURATION					
FOR SEDIMENTARY ROCKS, INDURATION IS THE HARDENING OF THE MATERIAL BY CEMENTING, HEAT, PRESSURE, ETC.					
FRIABLE	RUBBING WITH FINGER FREES NUMEROUS GRAINS; GENTLE BLOW BY HAMMER DISINTEGRATES SAMPLE.				
MODERATELY INDURATED	GRAINS CAN BE SEPARATED FROM SAMPLE WITH STEEL PROBE; BREAKS EASILY WHEN HIT WITH HAMMER.				
INDURATED	GRAINS ARE DIFFICULT TO SEPARATE WITH STEEL PROBE; DIFFICULT TO BREAK WITH HAMMER.				
EXTREMELY INDURATED	SHARP HAMMER BLOWS REQUIRED TO BREAK SAMPLE; SAMPLE BREAKS ACROSS GRAINS.				
BENCH MARK: NORTHEAST BRIDGE CORNER - NEAR BORING EB2-A		MARKED IN WHITE WITH - "G"			
		(ASSUMED) ELEVATION: 100 FT.			
NOTES:					

STATE	STATE PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	M-0423 (42608.1JA8)	3	



 SUMMIT CONSULTING ENGINEERING • ARCHITECTURE • SURVEYING REG. NUMBER P-0339 505 Meadowland Drive, Suite 107 Hillsborough, NC 27278-8551 Voice: (919) 732-8550 Fax: (919) 732-8599 www.summit-engineer.com	CHECKED BY: A. NASH	 APPROXIMATE SCALE IN FEET	<h2>BORING LOCATION PLAN</h2> <p>REPLACEMENT OF BRIDGE NO. 412 ON SR 2160 (OLD GOLDSTON RD.) OVER ROBESON CREEK ID NO. M-0423 (42608.1JA8) CHATHAM COUNTY, NORTH CAROLINA</p>
	DRAWN BY: M. BRANDON		
	DATE: APRIL 2010		



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

SHEET 4

PROJECT NO. 42608.1.JA8		ID. M-0423		COUNTY Chatham		GEOLOGIST Nash, A. A.	
SITE DESCRIPTION Bridge No. 412 on SR 2160 (Old Goldston Road) over Robeson Creek							GROUND WTR (ft)
BORING NO. EB1-A		STATION N/A		OFFSET N/A		ALIGNMENT -L-	
COLLAR ELEV. 100.4 ft		TOTAL DEPTH 20.5 ft		NORTHING 715,963		EASTING 1,943,748	
DRILL MACHINE Diedrich D-50		DRILL METHOD Mud Rotary				HAMMER TYPE Automatic	
DRILLER Duggins, W. T.		START DATE 10/23/10		COMP. DATE 10/23/10		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
105															
100														100.4	GROUND SURFACE
															ROADWAY EMBANKMENT
															Dark red medium stiff fine sandy silty CLAY (A-7-5) with trace gravel
95	97.0	3.4	3	2	4									94.9	ALLUVIAL
															Brown & red very soft fine sandy silty CLAY (A-7-5)
90	91.5	8.9	1	WOH	1									89.4	RESIDUAL
															Tan & orange very stiff clayey SILT (A-5)
85	86.5	13.9	4	4	12									84.4	WEATHERED ROCK
															(gray metavolcanic rock)
80	81.5	18.9												81.5	CRYSTALLINE ROCK
	79.9	20.5	60/0.1											79.9	Gray metavolcanic rock
			60/0												Boring Terminated with Tricone Refusal at Elevation 79.9 ft in Crystalline Rock: Gray Metavolcanic
75															1) Advanced 2-15/16" tri-cone bit to a depth of 20.5 feet.
70															2) Set HW casing to 3.5 feet below the existing ground surface.
65															3) Used creek water with bentonite as drilling fluid.
60															
55															
50															
45															
40															
35															
30															
25															



NCDOT GEOTECHNICAL ENGINEERING UNIT

BORELOG REPORT

SHEET 5

PROJECT NO. 42608.1.JA8	ID. M-0423	COUNTY Chatham	GEOLOGIST Nash, A. A.
SITE DESCRIPTION Bridge No. 412 on SR 2160 (Old Goldston Road) over Robeson Creek			GROUND WTR (ft)
BORING NO. EB1-B	STATION N/A	OFFSET N/A	ALIGNMENT -L-
COLLAR ELEV. 99.5 ft	TOTAL DEPTH 19.6 ft	NORTHING 715,937	EASTING 1,943,767
DRILL MACHINE Diedrich D-50	DRILL METHOD Mud Rotary	HAMMER TYPE Automatic	
DRILLER Duggins, W. T.	START DATE 10/25/10	COMP. DATE 10/25/10	SURFACE WATER DEPTH N/A

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100			ELEV. (ft)	DEPTH (ft)
100													99.5	GROUND SURFACE 0.0
													98.7	ASPHALT (9.5 inches) 0.8
95	95.9	3.6	5	2	3									
													93.5	ROADWAY EMBANKMENT 6.0
90	90.9	8.6	WOH	1	WOH									
85	85.9	13.6	3	6	8									
80	80.9	18.6												
	79.9	19.6	60/0.1											
			60/0											
75														
70														
65														
60														
55														
50														
45														
40														
35														
30														
25														
20														

NCDOT BORE SINGLE 10-0048-010.GPJ NC_DOT_GDT 12/14/10

- 1) Advanced 2-15/16" tri-cone bit to a depth of 19.6 feet.
- 2) Set HW casing to 3.5 feet below the existing ground surface.
- 3) Used creek water with bentonite as drilling fluid.



NCDOT GEOTECHNICAL ENGINEERING UNIT BORELOG REPORT

SHEET 6

PROJECT NO. 42608.1JA8		ID. M-0423		COUNTY Chatham		GEOLOGIST Nash, A. A.	
SITE DESCRIPTION Bridge No. 412 on SR 2160 (Old Goldston Road) over Robeson Creek							GROUND WTR (ft)
BORING NO. EB2-A		STATION N/A		OFFSET N/A		ALIGNMENT -L-	
COLLAR ELEV. 99.6 ft		TOTAL DEPTH 23.6 ft		NORTHING 716,012		EASTING 1,943,823	
DRILL MACHINE Diedrich D-50		DRILL METHOD Mud Rotary				HAMMER TYPE Automatic	
DRILLER Duggins, W. T.		START DATE 10/25/10		COMP. DATE 10/25/10		SURFACE WATER DEPTH N/A	

ELEV (ft)	DRIVE ELEV (ft)	DEPTH (ft)	BLOW COUNT			BLOWS PER FOOT					SAMP. NO.	LOG	SOIL AND ROCK DESCRIPTION	DEPTH (ft)	
			0.5ft	0.5ft	0.5ft	0	25	50	75	100					
100															
95	96.1	3.5	2	2	3								M	GROUND SURFACE	0.0
90	91.1	8.5	6	11	9								M	ROADWAY EMBANKMENT Red medium stiff silty CLAY (A-7-5) with trace sand	5.5
85	86.1	13.5	100/0.5										D	RESIDUAL Gray & red very stiff fine to coarse sandy silty CLAY (A-7-5) with some rock fragments; saprolitic	12.5
80	81.1	18.5	41	59/0.3									D	WEATHERED ROCK (gray to tan metavolcanic rock)	23.6
75	76.1	23.5	60/0.1										No Rec	Boring Terminated at Elevation 76.0 ft in Weathered Rock: (Gray Metavolcanic)	
70														1) Advanced 2-15/16" tri-cone bit to a depth of 23.5 feet.	
65														2) Set HW casing to 3.5 feet below the existing ground surface.	
60														3) Used creek water with bentonite as drilling fluid.	
55															
50															
45															
40															
35															
30															
25															
20															